

AMENDMENTS TO THE CLAIMS

1 (Currently Amended) An oligomer-modified anionically polymerized polymer comprising the reaction product of:

- (a) an a free-radically polymerized oligomer polymerized obtained from reaction of at least one monomer selected from the group consisting of vinyl aromatic monomers and ~~epoxy functional monomers ester~~ functional monomers and at least one monomer selected from the group consisting of epoxy functional monomers, anhydride functional monomers, ester functional monomers and carboxylic acid functional monomers, the oligomer having a number average molecular weight of about [500]1000 to about [10,000] 5000 g/mol and a weight average molecular weight of about [1000]1500 to about [60,000]18,000 g/mol; a number average number of functional groups from about 4 to about 12; and a polydispersity index of about 1.5 to about 4.5 and
- (b) an anionically polymerized polymer

2 (Canceled)

3 (Canceled)

4 (Canceled)

5. (Original) The oligomer-modified anionically polymerized polymer of claim 1, wherein the oligomer has a solubility parameter from about 13 to 30

6 (Original) The oligomer-modified anionically polymerized polymer of claim 1, wherein the anionically polymerized polymer comprises a polymer selected from the group consisting of polystyrene, polybutadiene, polyisoprene, and random, block or tapered copolymers made from monomers selected from the group consisting of styrene, butadiene, and isoprene

7 (Original) The oligomer-modified anionically polymerized polymer of claim 1, wherein the anionically polymerized polymer has a number average molecular weight of about 3,000 to 300,000 g/mol

8 (Original) The oligomer-modified anionically polymerized polymer of claim 1, wherein the anionically polymerized polymer has a number average molecular weight of about 20,000 to 300,000 g/mol

9. (Original) The oligomer-modified anionically polymerized polymer of claim 1, wherein the anionically polymerized polymer is polymerized from at least one vinyl aromatic monomer and at least one conjugated diene molecule

10 (Original) The oligomer-modified anionically polymerized polymer of claim 1, wherein the anionically polymerized polymer is polymerized from vinyl aromatic monomers and conjugated diene monomers in a molar ratio of vinyl aromatic monomer to conjugated diene monomer of about 0.1 to about 1.0

11 (Original) The oligomer-modified anionically polymerized polymer of claim 1, wherein the anionically polymerized polymer is polymerized from conjugated diene monomers and has a content of 1,2- structures from about 8 to 70 mole %

12 (Original) The oligomer-modified anionically polymerized polymer of claim 1, wherein the oligomer-modified anionically polymerized polymer has a percentage of coupled chains from about 2 to 90 mole %

13 (Original) The oligomer-modified anionically polymerized polymer of claim 1, wherein the oligomer-modified anionically polymerized polymer has a number average molecular weight from about 5,000 to 1,000,000 g/mol

14 (Original) The oligomer-modified anionically polymerized polymer of claim 1, wherein the oligomer is polymerized from vinyl aromatic and epoxy functional monomers.

15 (Original) The oligomer-modified anionically polymerized polymer of claim 1, wherein the reaction product comprises about 0.1 to 40 wt % oligomer based on the total amount of reacted oligomer and anionically polymerized polymer.

16 (Original) The oligomer-modified anionically polymerized polymer of claim 15, wherein the anionically polymerized polymer is a thermoplastic having a number average molecular weight of about 3,000 to 50,000 g/mol.

17 (Original) The oligomer-modified anionically polymerized polymer of claim 16, wherein the oligomer is polymerized from about 1 to 60 mole % epoxy-functional or carboxylic acid-functional monomers.

18 (Original) The oligomer-modified anionically polymerized polymer of claim 1, wherein the reaction product comprises about 0.1 to 5 wt % oligomer based on the total amount of reacted oligomer and anionically polymerized polymer.

19 (Currently Amended) The oligomer-modified anionically polymerized polymer of claim 18, wherein the anionically polymerized polymer is a thermoplastic polymer having a number average molecular weight of about 20,000 to 100,000 g/mol.

20 (Original) The oligomer-modified anionically polymerized polymer of claim 19, wherein the anionically polymerized polymer comprises a polymer selected from the group consisting of polystyrene, polybutadiene, polyisoprene, and random, block or tapered copolymers made from monomers selected from the group consisting of styrene, butadiene, and isoprene.

21 (Original) The oligomer-modified anionically polymerized polymer of claim 18, wherein the oligomer is polymerized from about 0.5 to 60 mole % epoxy-functional or carboxylic acid-functional monomers

22 (Original) The oligomer-modified anionically polymerized polymer of claim 15, wherein the anionically polymerized polymer is a thermoplastic having a number average molecular weight of about 5,000 to 40,000 g/mol.

23. (Currently Amended) A method for preparing an oligomer-modified anionically polymerized polymer, the method comprising reacting an anionically polymerized polymer with ~~an~~ a free-radically polymerized oligomer polymerized obtained from reaction of at least one monomer selected from the group consisting of vinyl aromatic monomers and ~~epoxy functional monomers ester functional monomers and at least one monomer selected from the group consisting of epoxy functional monomers, anhydride functional monomers, ester functional monomers and carboxylic acid functional monomers~~, the oligomer having a number average molecular weight of about ~~[500]~~1000 to about ~~[10,000]~~ 5,000 g/mol and a weight average molecular weight of about ~~[1000]~~1500 to about ~~[60,000]~~18,000 g/mol; a number average number of functional groups from about 4 to about 12; and a polydispersity index of about 1.5 to about 4.5.

24. (Original) The method of claim 23, wherein the oligomer is polymerized in a reactor using a continuous polymerization process at a polymerization temperature of from about 180 degree. C to about 350.degree C with a residence time in the reactor of less than about 60 minutes

25 (Original) The method of claim 23, wherein the oligomer is reacted with the anionically polymerized polymer in the same reaction zone where the anionically polymerizable polymer is polymerized

26 (Original) The method of claim 23, wherein the anionically polymerized polymer is polymerized in a first reaction zone and reacted with the oligomer in a second reaction zone.

27 (Original) The method of claim 23 comprising polymerizing the anionically polymerized polymer, adding a sufficient amount of terminating agent to deactivate a portion of the living chains in the anionically polymerized polymer and reacting at least some of the remaining living chains with the oligomer

28 (Original) The method of claim 23, wherein the molar ratio of oligomer to anionically polymerized polymer in the reaction is between 0.02 and 1

29 (Original) The method of claim 23, wherein reacting the anionically polymerized polymer with the oligomer comprises coupling anionically polymerized polymer with the oligomer and further wherein the average number of anionically polymerized polymer chains reacted with an oligomer is about 2 to 30

30 (Original) The method of claim 29, wherein about 2 to about 90 mole % of the anionically polymerized polymer undergoes coupling reactions

31 (Original) The method of claim 23, wherein reacting the anionically polymerized polymer with the oligomer comprises end-capping anionically polymerized polymer with oligomer and further wherein at least 10 mole % of the anionically polymerized polymer undergoes end-capping reactions.

32 (Original) A polymer composition comprising: (a) the oligomer-modified anionically polymerized polymer of claim 1; and (b) a linear anionically polymerized polymer

33 (Original) The polymer composition of claim 32, wherein the linear anionically polymerized polymer comprises a portion of the anionically polymerized polymer that has been deactivated by a terminating agent

34 (Original) The polymer composition of claim 33, wherein the linear anionically polymerized polymer makes up about 10 to 90 mole % of the polymer composition

35 (Original) A reinforced material comprising the oligomer-modified anionically polymerized polymer of claim 1 mixed with a material to be reinforced

36 (Original) The reinforced material of claim 35, wherein the material to be reinforced is selected from the group consisting of asphalt, plastics and rubbers

37 (Withdrawn) The reinforced material of claim 35, wherein the reinforced material is a plastic selected from the group consisting of polyamides, polyurethanes, polyethers, polysulfones, polyether-ketones, polyetherether ketones, polyimides, polyetherimides, polycarbonates, polyesters, polystyrene and copolymers thereof

38 (Original) An article made from the reinforced material of claim 35

39 (Original) The article of claim 38, wherein the article is an extruded article, an injection molded article, a compression molded article or a tire

40 (Original) A modified asphalt comprising asphalt mixed with the oligomer-modified anionically polymerized polymer of claim 1

41 (Original) The modified asphalt of claim 40 comprising about 1 to 15 wt % of the oligomer-modified anionically polymerized polymer based on the total weight of the asphalt and the oligomer-modified anionically polymerized polymer

42 (Original) The modified asphalt of claim 40 comprising about 5 to 20 wt % of the oligomer-modified anionically polymerized polymer based on the total weight of the asphalt and the oligomer-modified anionically polymerized polymer

43 (Original) A modified asphalt comprising asphalt mixed with the polymer composition of claim 32

44 (Original) The modified asphalt of claim 43 comprising about 1 to 20 wt % of the polymer composition based on the total weight of the asphalt and the polymer composition

45 (Original) An adhesive composition comprising the oligomer-modified anionically polymerized polymer of claim 1, wherein the reaction product comprises about 0.05 to 5 wt % oligomer based on the total amount of reacted oligomer and anionically polymerized polymer

46 (Original) The adhesive composition of claim 45, wherein the oligomer is polymerized from about 0.5 to 30 mole % epoxy functional monomer

47 (Original) The adhesive composition of claim 45, wherein the oligomer is polymerized from about 10 to 75 mole % vinyl aromatic monomer

48 (Original) The adhesive composition of claim 45 further comprising at least one additive selected from the group consisting of tackifiers, stabilizers, plasticizers and antioxidants

49 (Original) The adhesive composition of claim 45 comprising about 15 to 30 wt % oligomer-modified anionically polymerized polymer, about 45 to 60 wt % tackifier, about 15 to 30 wt % plasticizer and about 0.05 to 2 wt % antioxidant

50. (Original) A modified plastic comprising a plastic mixed with the oligomer-modified anionically polymerized polymer of claim 1, the mixture comprising about 1 to 15 wt % oligomer-modified anionically polymerized polymer based on the total weight of the oligomer-modified anionically polymerized polymer and the plastic

51. (Original) The modified plastic of claim 50, wherein the plastic comprises a polymer selected from the group consisting of polystyrene, polybutadiene, polyisoprene, and random, block or tapered copolymers made from monomers selected from the group consisting of styrene, butadiene, and isoprene and having a number average molecular weight of about 3,000 to 300,000 g/mol

52 (Original) The modified plastic of claim 50 wherein the reaction product comprises about 0.1 to 33 wt % oligomer based on the total amount of reactor oligomer and anionically polymerized polymer

53 (Original) The modified plastic of claim 52, wherein the oligomer comprises about 0.5 to 50 mole % epoxy-functional, anhydride-functional or carboxylic acid-functional monomer.

54 (Original) The modified plastic of claim 50, wherein the anionically polymerized polymer comprises a polystyrene

55 (Original) The modified plastic of claim 50, wherein the mixture comprises about 1 to 10 wt % oligomer-modified anionically polymerized polymer based on the total weight of the oligomer-modified anionically polymerized polymer and the plastic

56 (Original) The modified plastic of claim 52, wherein the reaction product comprises about 10 to 30 wt % oligomer based on the total amount of reacted oligomer and anionically polymerized polymer.

57 (Original) The modified plastic of claim 56, wherein the anionically polymerized polymer comprises a polystyrene

58 (Original) The modified plastic of claim 50, wherein the plastic is selected from the group consisting of polyamides, polyurethanes, polyethers, polysulfones, polyether-ketones, polyetherether ketones, polyimides, polyetherimides, polycarbonates, polyesters, polystyrene and copolymers thereof

59 (Original) The modified plastic comprising a plastic mixed with the oligomer-modified anionically polymerized polymer of claim 22, wherein the modified plastic comprises about 1 to 10 wt. % of oligomer-modified anionically polymerized plastic based on the total weight of the plastic and the oligomer-modified anionically polymerized polymer

60 (New) An oligomer-modified anionically polymerized polymer comprising the reaction product of:

(a) a free-radically polymerized oligomer obtained from reaction of at least one monomer selected from the group consisting of vinyl aromatic monomers and ester functional monomers and at least one monomer selected from the group consisting of epoxy functional monomers, anhydride functional monomers, ester functional monomers and carboxylic acid functional monomers, the oligomer having a number average molecular weight of about 1000 to about 10,000 g/mol and a weight average molecular weight of about 1500 to about 18,000 g/mol; a number average number of functional groups from about 4 to about 12; a polydispersity index of about 1.5 to about 4.5; a solubility parameter from about 13 to 30; and is polymerized from about 0.5 to 60 mole % epoxy-functional or carboxylic acid-functional monomers in a reactor using a continuous polymerization process at a polymerization temperature of from about 180 degree C to about 350 degree C with a residence time in the reactor of less than about 60 minutes; and

(b) an anionically polymerized polymer polymerized from vinyl aromatic monomers and conjugated diene monomers in a molar ratio of vinyl aromatic monomer

to conjugated diene monomer of about 0.1 to about 1.0; wherein the anionically polymerized polymer is a thermoplastic having a number average molecular weight of about 3,000 to 300,000 g/mol

61 (New) A reinforced material comprising a compound that is one of asphalt, plastics and rubbers and the reaction product of

(a) a free-radically polymerized oligomer obtained from reaction of at least one monomer selected from the group consisting of vinyl aromatic monomers and ester functional monomers and at least one monomer selected from the group consisting of epoxy functional monomers, anhydride functional monomers, ester functional monomers and carboxylic acid functional monomers, the oligomer having a number average molecular weight of about 500 to about 10,000 g/mol and a weight average molecular weight of about 1000 to about 60,000 g/mol; and is made in a reactor using a continuous polymerization process at a polymerization temperature of from about 180 degree C to about 350 degree C with a residence time in the reactor of less than about 60 minutes; and

(b) an anionically polymerized polymer

62 (New) An article comprising the reinforced material of claim 61

63 (New) The article of claim 62, wherein the article is an extruded article, an injection molded article, a compression molded article or a tire

64 (New) A modified asphalt comprising asphalt and the reaction product of

(a) a free-radically polymerized oligomer obtained from reaction of at least one monomer selected from the group consisting of vinyl aromatic monomers and ester functional monomers and at least one monomer selected from the group consisting of epoxy functional monomers, anhydride functional monomers, ester functional monomers and carboxylic acid functional monomers, the oligomer having a number average molecular weight of about 500 to about 10,000 g/mol and a weight average molecular weight of about 1000 to about 60,000 g/mol; and is made in a reactor using a continuous

polymerization process at a polymerization temperature of from about 180 degree C to about 350 degree C with a residence time in the reactor of less than about 60 minutes; and

(b) an anionically polymerized polymer

65 (New) The modified asphalt of claim 64 comprising about 1 to 20 wt % of the oligomer-modified anionically polymerized polymer based on the total weight of the asphalt and the oligomer-modified anionically polymerized polymer

66 (New) A composition comprising an adhesive composition including the reaction product of

(a) a free-radically polymerized oligomer obtained from reaction of at least one monomer selected from the group consisting of vinyl aromatic monomers and ester functional monomers and at least one monomer selected from the group consisting of epoxy functional monomers, anhydride functional monomers, ester functional monomers and carboxylic acid functional monomers, the oligomer having a number average molecular weight of about 500 to about 10,000 g/mol and a weight average molecular weight of about 1000 to about 60,000 g/mol; and is made in a reactor using a continuous polymerization process at a polymerization temperature of from about 180 degree C to about 350 degree C with a residence time in the reactor of less than about 60 minutes; and

(b) an anionically polymerized polymer;

wherein the reaction product comprises about 0.05 to 5 wt % oligomer based on the total amount of reacted oligomer and anionically polymerized polymer and

(c) at least one additive selected from the group consisting of tackifiers, stabilizers, plasticizers and antioxidants

67 (New) The adhesive composition of claim 66, wherein the oligomer is polymerized from about 0.5 to 30 mole % epoxy functional monomer

68 (New) The adhesive composition of claim 66, wherein the oligomer is polymerized from about 10 to 75 mole % vinyl aromatic monomer

69 (New) A modified plastic comprising a plastic mixed with the reaction product of

(a) a free-radically polymerized oligomer obtained from reaction of at least one monomer selected from the group consisting of vinyl aromatic monomers and ester functional monomers and at least one monomer selected from the group consisting of epoxy functional monomers, anhydride functional monomers, ester functional monomers and carboxylic acid functional monomers, the oligomer having a number average molecular weight of about 500 to about 10,000 g/mol and a weight average molecular weight of about 1000 to about 60,000 g/mol; and is made in a reactor using a continuous polymerization process at a polymerization temperature of from about 180 degree C to about 350 degree C with a residence time in the reactor of less than about 60 minutes; and

(b) an anionically polymerized polymer;

wherein the mixture comprising of about 1 to 15 wt. % oligomer-modified anionically polymerized polymer based on the total weight of the oligomer-modified anionically polymerized polymer and the plastic

70 (New) The modified plastic of claim 69 wherein the reaction product comprises about 0.1 to 33 wt % oligomer based on the total amount of reactor oligomer and anionically polymerized polymer

71 (New) The modified plastic of claim 70, wherein the oligomer comprises about 0.5 to 50 mole % epoxy-functional, anhydride-functional or carboxylic acid-functional monomer

72 (New) The modified plastic of claim 69, wherein the anionically polymerized polymer comprises a polystyrene

73 (New) The modified plastic of claim 69, wherein the plastic is selected from the group consisting of polyamides, polyurethanes, polyethers, polysulfones, polyether-ketones, polyether ether ketones, polyimides, polyetherimides, polycarbonates, polyesters, polystyrene and copolymers thereof